29th International Cosmic Ray Conference Pune (2005) **4**, 21–22

Observations of the Galactic Centre Region in Very High Energy Gamma-Rays with H.E.S.S.

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The central 300 parsecs of our Galaxy contain the richest population of potential very high energy (VHE) γ-ray sources of any part of the sky. The wide field of view of H.E.S.S. [1] (5°) allows us to observe all of these candidate sources with a single pointing of the instrument. In addition to the known γ-ray sources G 0.9+0.1 [2] and HESS J1745−290 (close to Sgr A*) [3, 4, 5], the region contains several shell-type SNR, at least one additional pulsar wind nebula (the 'Mouse', G 359.23-0.82) and two unidentified EGRET sources. In addition to these potential 'active' particle accelerators, the Galactic Centre (GC) region provides probably the best target for the detection of VHE γ-rays from 'passive' cosmic ray targets [6]. The dense and massive molecular clouds of the region, Sgr A, B and C, provide efficient targets for diffuse cosmic rays, leading to γ-ray production via the decay of neutral pions. At lower energies the EGRET instrument detected strong diffuse emission from the GC region [7]. However, the presence of two strong sources in the region and the rather poor angular resolution of EGRET, prevented the determination of the density of $\sim$ GeV cosmic rays in this region. With the order of magnitude better angular resolution of H.E.S.S. the giant molecular clouds of the region are individually resolvable.

Figure 1 shows a smoothed and acceptance corrected count map of the galactic center region from 50 hours of observations with the full 4-telescope array in 2004. The VHE γ-ray sources G 0.9+0.1 and HESS J1745−290 are visible. Also shown are contours of the molecular tracer CS taken from [8] and smoothed to match the angular resolution of H.E.S.S.. The resulting map indicates the expected morphology for diffuse emission which could be potentially observable with H.E.S.S., assuming a uniform cosmic ray density in the region. As the expected flux is rather low, $\sim 10^{-12}$ cm^{-2} s^{-1} ($>$ 1 TeV, following [6] and assuming a cosmic ray density as measured locally), careful subtraction of the two point-like sources is required to search for such emission.

Results of the H.E.S.S. search for new point sources and diffuse emission in the region will be presented at the conference.

References

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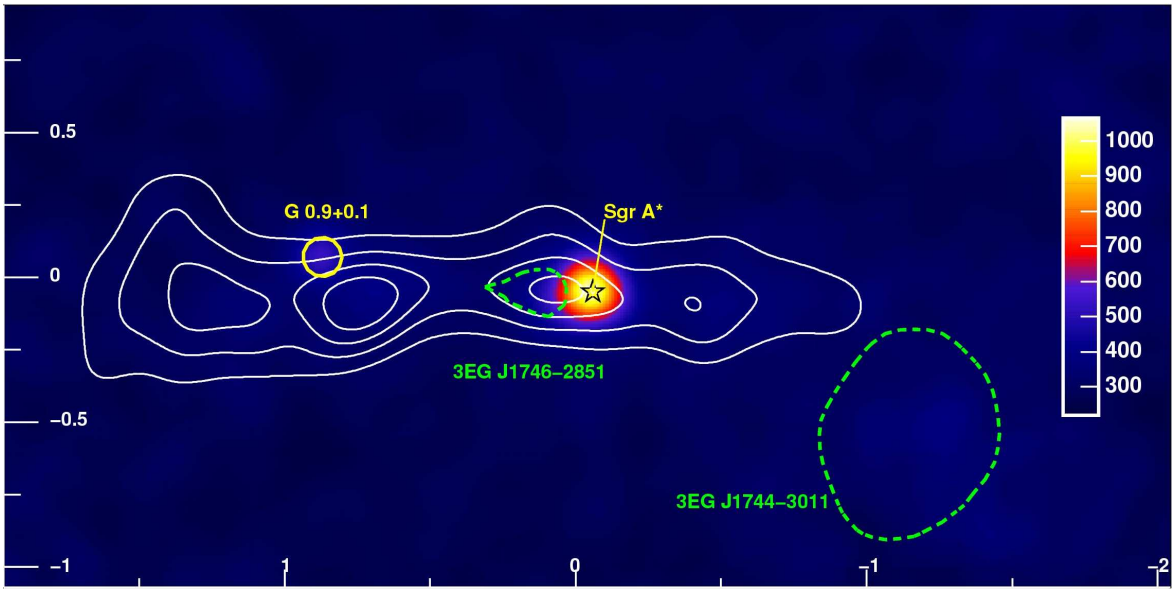

Figure 1. Smoothed and acceptance corrected count map of the Galactic Center region from H.E.S.S. observations in 2004. The known VHE γ-ray sources G 0.9+0.1 and HESS J1745−290 (coincident with Sgr A*) are marked with a circle and a star, respectively. The 90% confidence contours are given for the positions of the two unidentified EGRET sources in this region (green dashed lines). The solid contours show CS emission smoothed to match the H.E.S.S. point spread function.